



*Disposition of Surplus  
Weapons Fissile Materials*



*DOE and Foreign  
Research Reactors*



*Defense Complex Clean-Up*



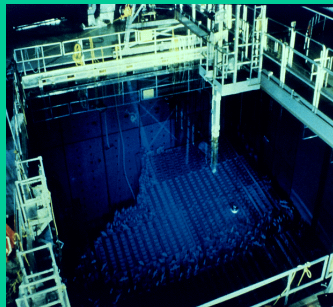
**March 7, 2000**

# *Office of Civilian Radioactive Waste Management Program Overview*

*Our mission is to manage and dispose of the Nation's spent nuclear fuel and high-level radioactive waste. We will provide leadership in developing and implementing strategies that assure public and worker health and safety, protect the environment, merit public confidence, and are economically viable.*



*Commercial Power Reactors*



*SNF Storage Pools*

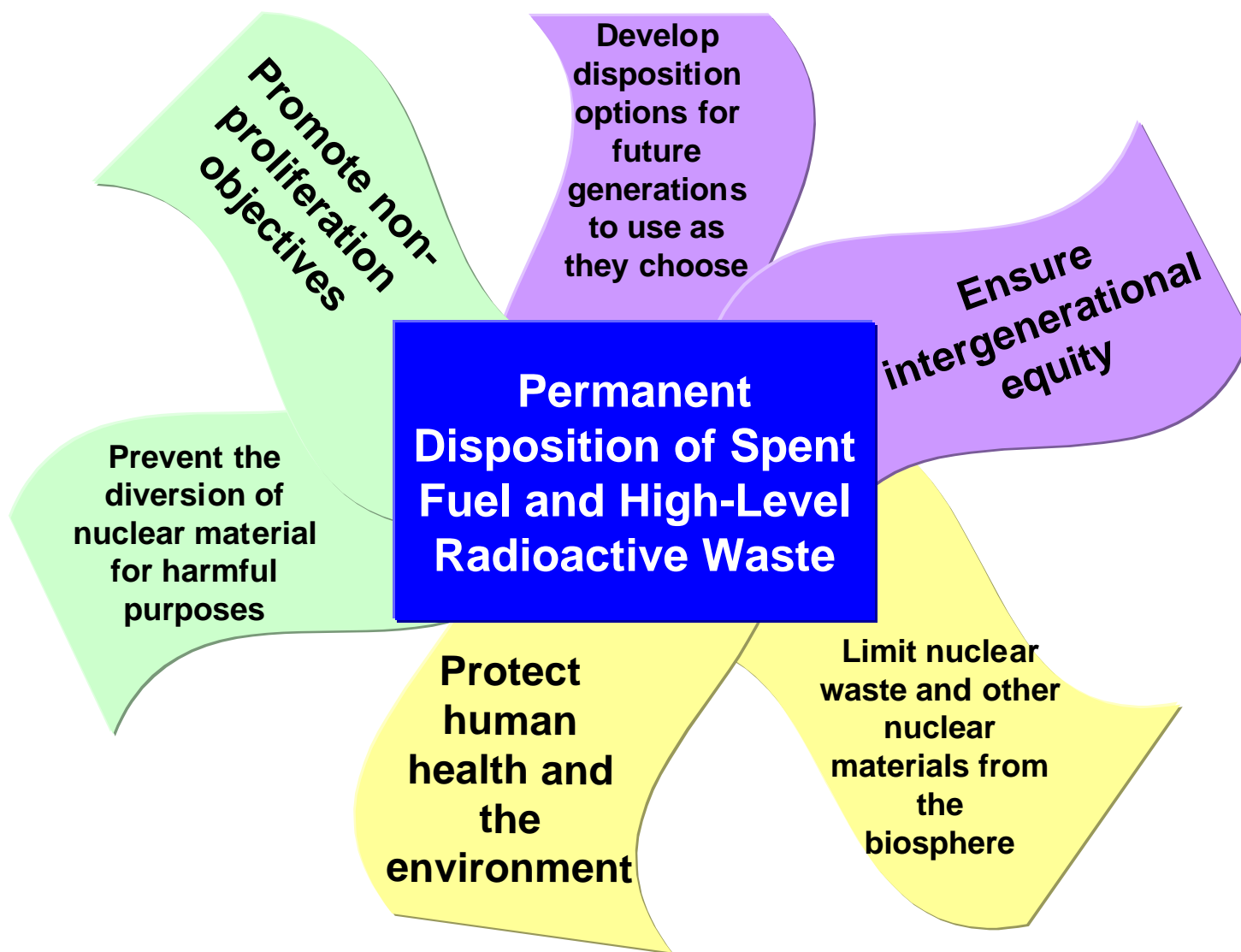


*Dry Cask Storage*



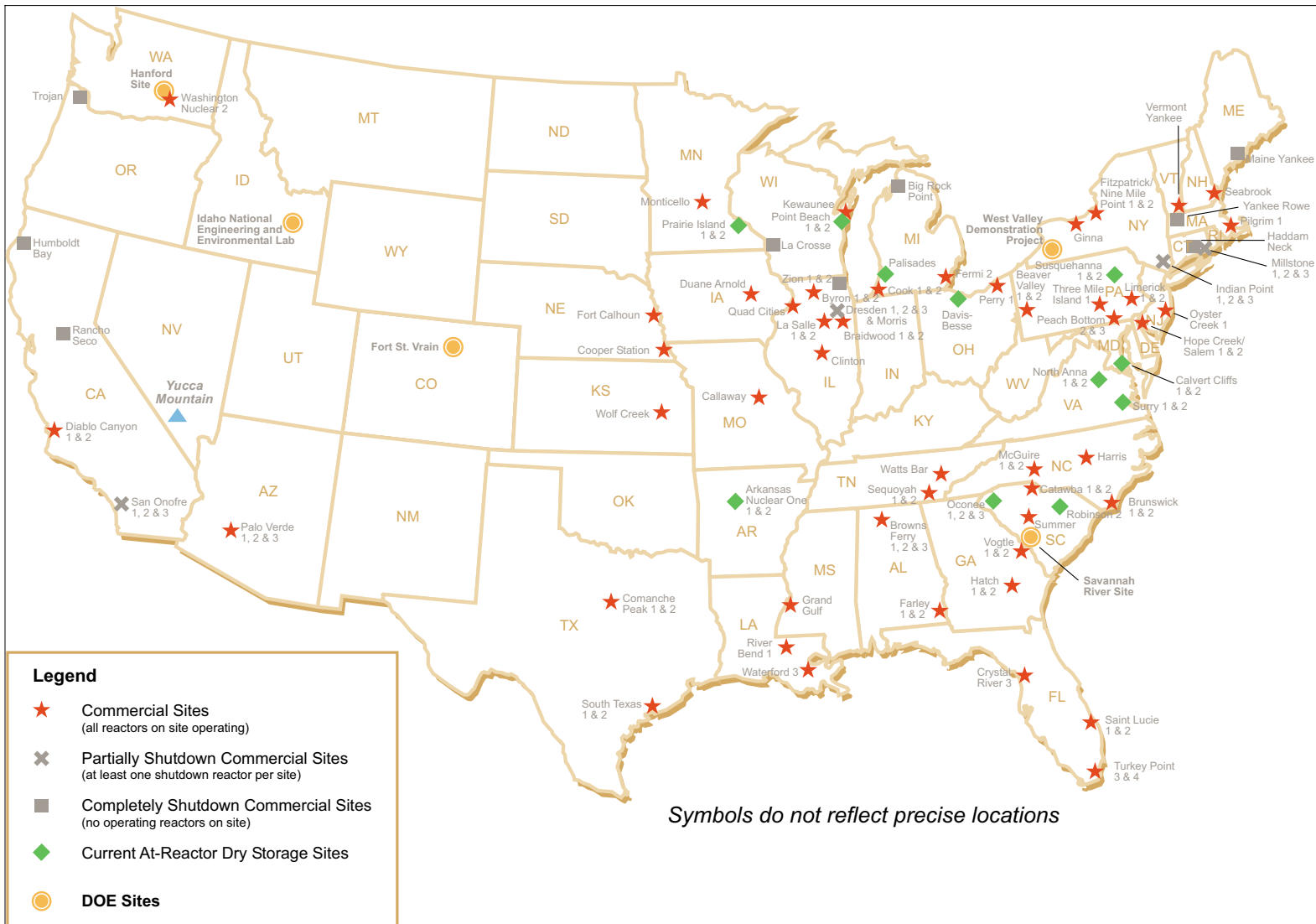
*Naval Propulsion Reactor*

# *U.S. Policy Supports Permanent Disposition*



***“High-level radioactive waste and spent nuclear fuel have become major subjects of public concern, and appropriate precautions must be taken to ensure that such waste and spent fuel do not adversely affect public health and safety and the environment for this or future generations”***  
**-- Nuclear Waste Policy Act**

# Current Location of Nuclear Materials Destined for Geologic Disposal

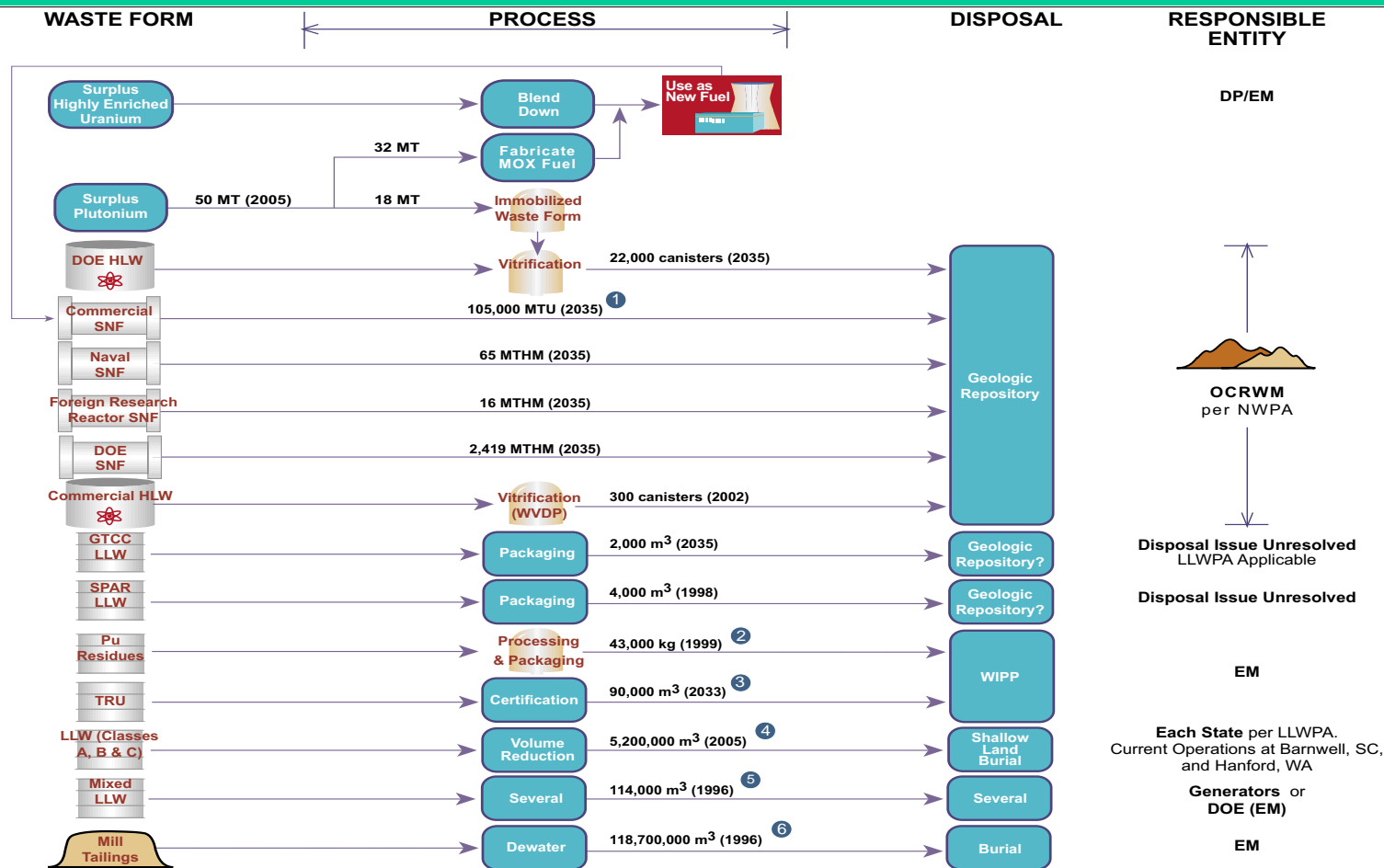


map 1299 eis & current dry hqcc.fh7

As of January 27, 2000



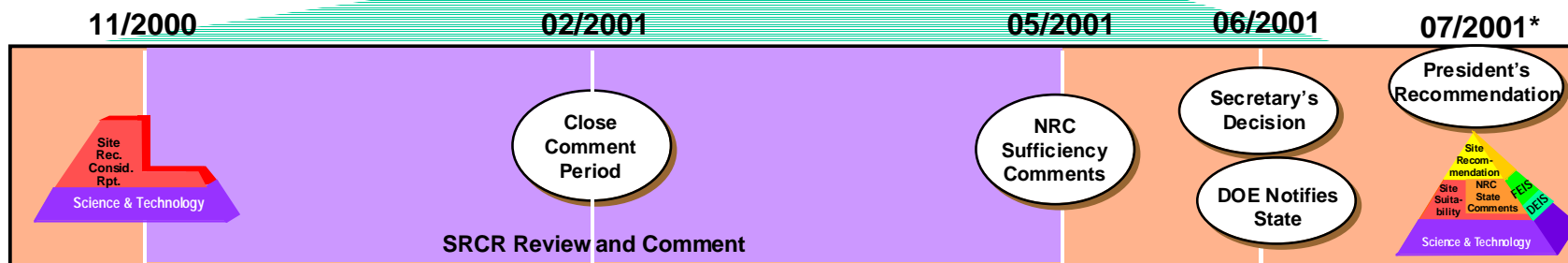
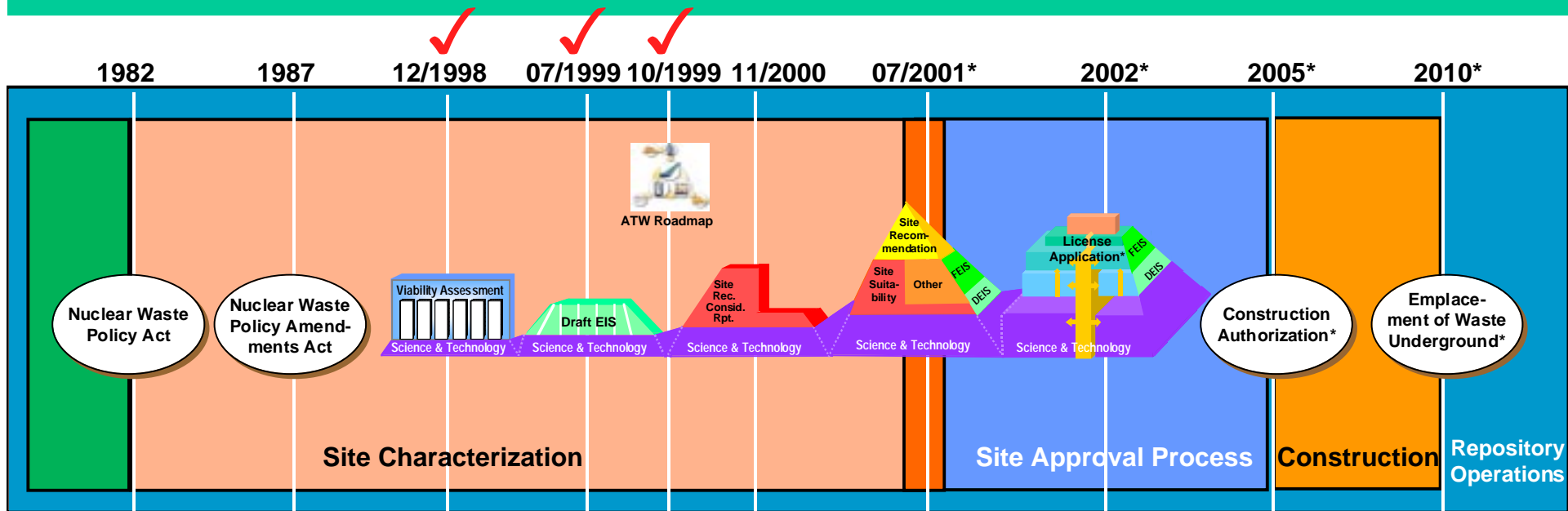
# Nuclear Materials Destined for Geologic Disposal



Source: Draft Yucca Mountain Environmental Impact Statement (DOE/EIS-0250D, July 1999), except as noted below.

- 1 EIS "high" case, assuming all reactors obtain 10-year operating license extensions. OCRWM base case (no new orders, no license extensions) assumes 87,000 MTU.
- 2 First and Second RODs on Management of Certain Plutonium Residues, Nov 98 & Feb 99. (Pu residues to be processed & packaged at Rocky Flats and SRS, and disposed at WIPP)
- 3 Integrated Data Base Report (IDB) 1996, DOE/RW-0006, Rev. 13, Dec 97, Table 3.4. (Final waste-form volume, retrievably stored and projected mixed and unmixed CH and RH TRU)
- 4 IDB Rev. 13, Tables 4.2 and 4.3. (Projected DOE and commercial LLW cumulative disposal by EOY 2005. Excludes 41,000,000 m<sup>3</sup> untreated EM-40 LLW, IDB Table 6.2)
- 5 IDB Rev. 13, Table 8.2. (Includes DOE RCRA and TSCA, and commercial MLLW. Excludes 8,500,000 m<sup>3</sup> untreated EM-40 MLLW, IDB Table 6.2)
- 6 IDB Rev. 13, Table 5.1.

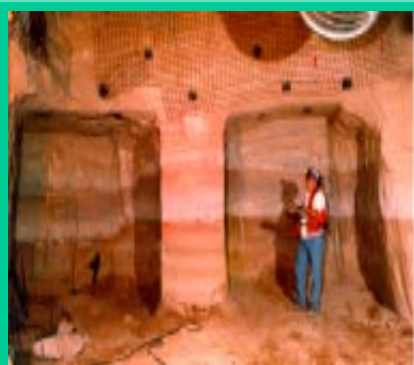
# Major Planned Repository Milestones



	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05
<b>Appropriation</b>	346	354	352.5	437.5	380	884	945	1,192

\*If site is approved and budget supports schedule.

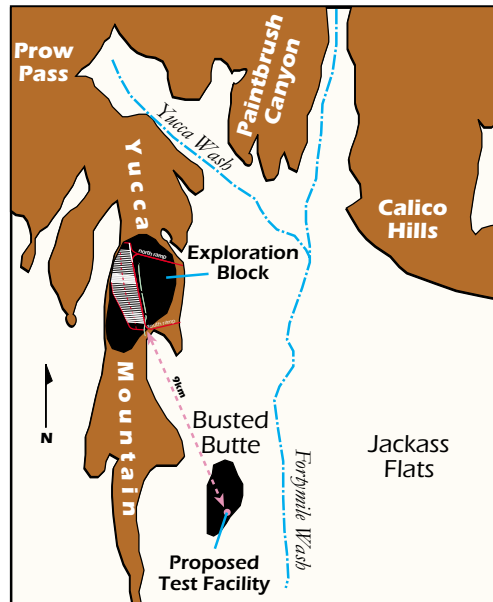
# *Investigations Focus on Remaining Uncertainties*



- **The focus of scientific investigations is on the key remaining uncertainties about the Yucca Mountain site**
  - Examining the presence and movement of water through the repository
  - Determining the effect of water movement on waste packages
  - Measuring the effect of heat on geologic and hydrologic behavior
- **Key data comes from many diverse sources**
  - Exploratory Studies Facility, enhanced characterization of repository block, surface-based testing
  - Fran Ridge and Busted Butte sites, natural analogue sites
  - National Laboratories and Atlas Engineering Facility



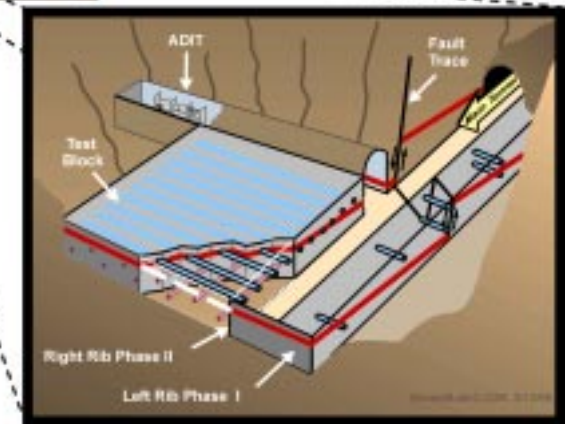
# Examining the Presence and Movement of Water



**Location map for  
Busted Butte**



**Phase I tracer test in  
Busted Butte test alcove**



**Southern Busted Butte  
unsaturated zone  
transport test**



# ***Measuring the Effects of Heat on Geologic and Hydrologic Behavior***

**Drift Scale Test**



**Single Heater Test**



**Large Block Test**



## **Thermal Testing:**

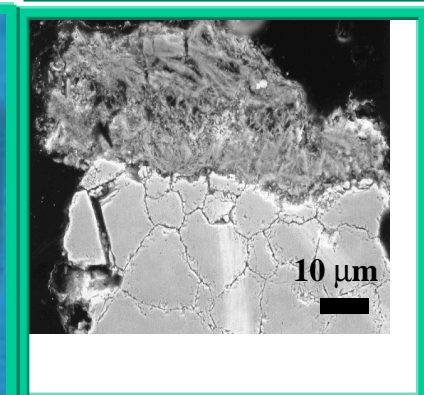
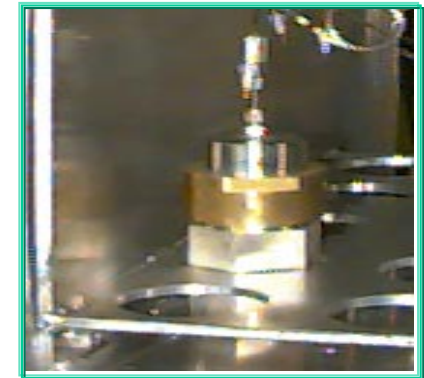
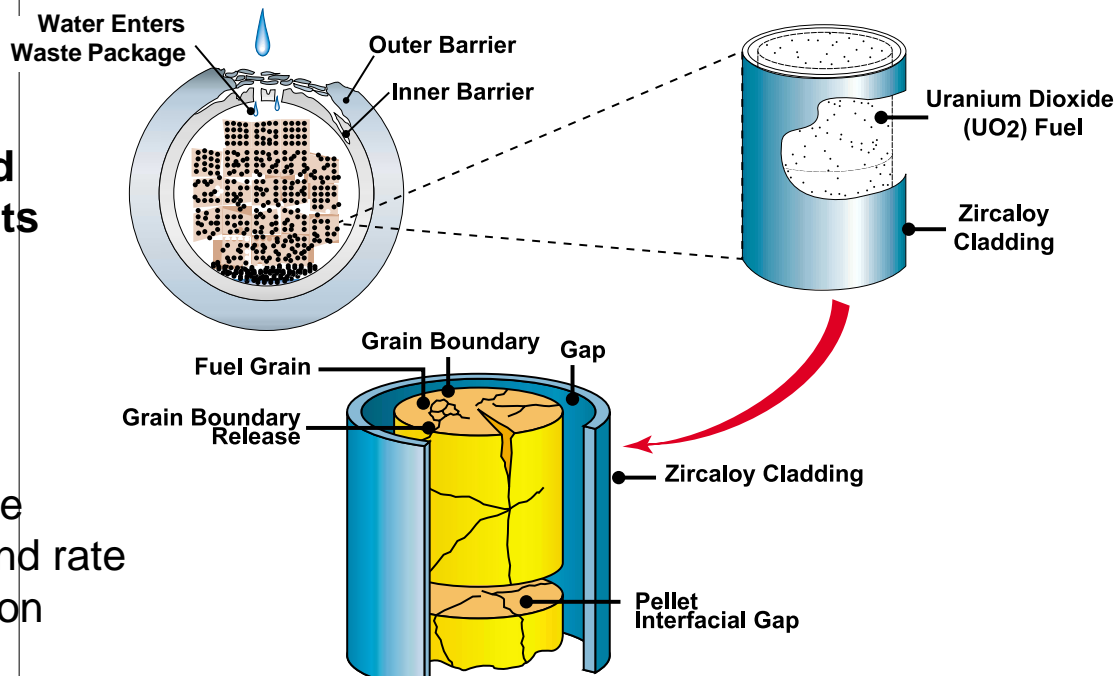
- Single heater test yielded information on how heat affects rock chemistry and mechanics, and site hydrology.
- Large block test investigated the effects of heat on a 10 x 10 x 15-foot block of rock from the potential repository host rock formation.
- Drift scale test, initiated December 3, 1997, will approximate the heat from waste packages in a repository emplacement drift.



# Effect of Water on the Waste Form

## Corrosion and Leach Tests

- Determine corrosion processes
- Determine radionuclide solubility and rate of dissolution



# *Evolving the Design of Engineered Components*



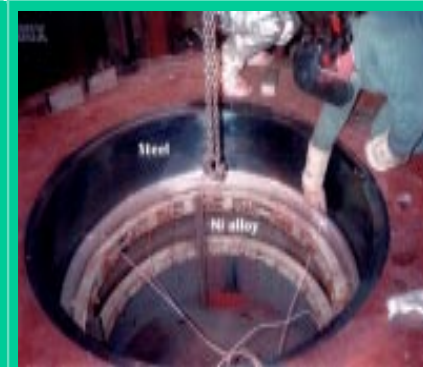
- **The engineered barriers of a potential repository must complement the natural system at Yucca Mountain**

- We are continually evaluating a diverse range of possible repository designs that work well in concert with the Yucca Mountain site



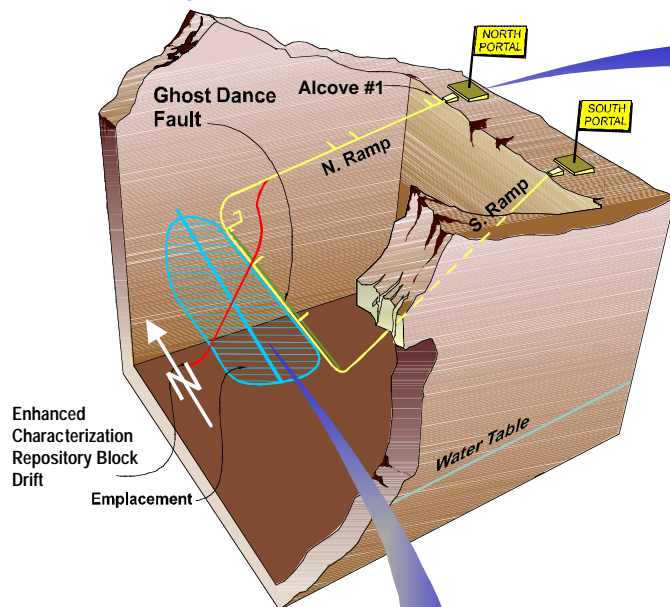
- **The design process is an iterative process, continually improving based on:**

- Newly acquired scientific information
  - Evolution of performance assessment models
  - Design evolution
  - Comments from external review groups

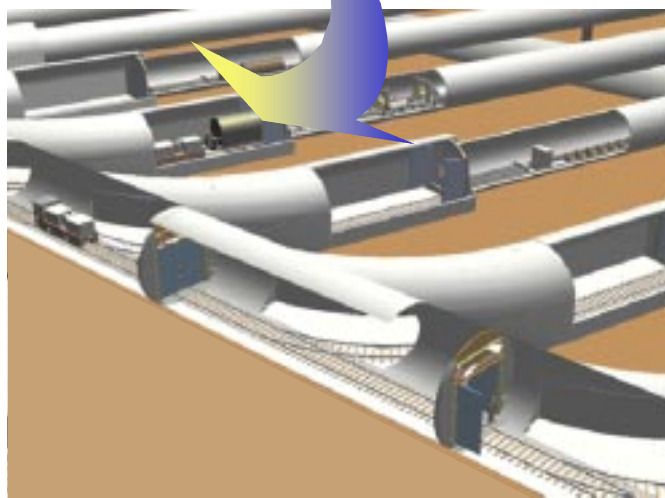
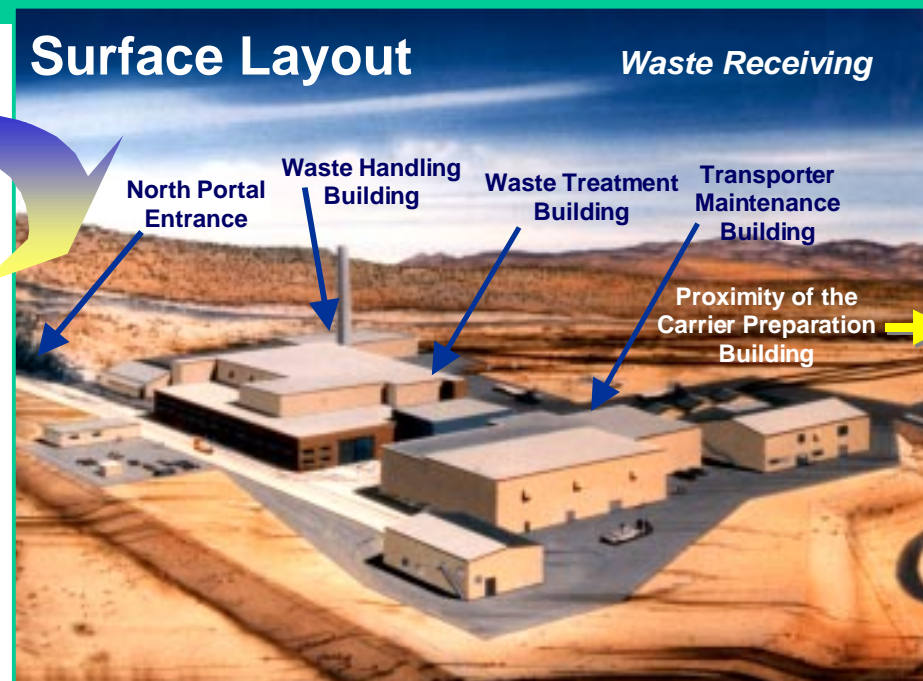


# Repository Reference Design Concept

## Repository Concept



## Surface Layout



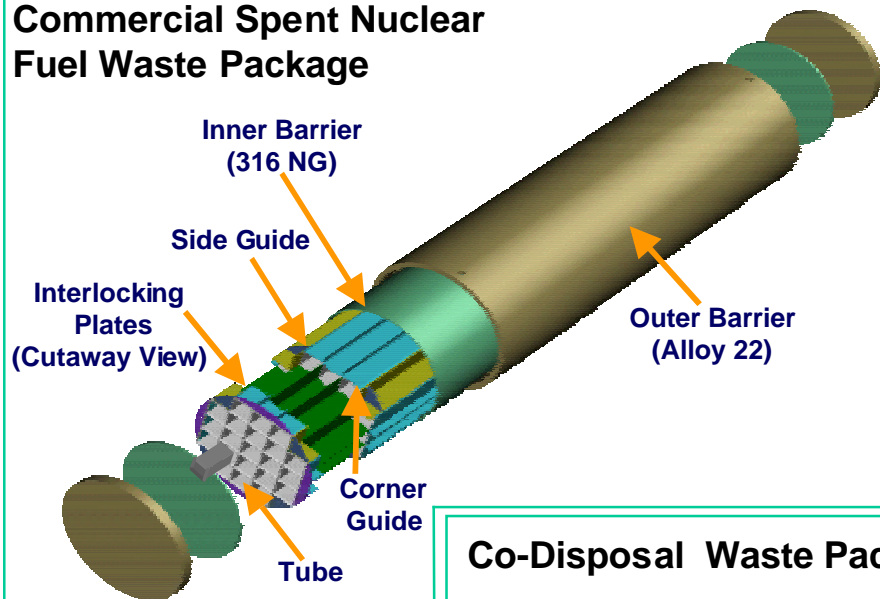
## Waste Emplacement

The proposed repository will include approximately 100 placement tunnels (73 miles of tunnels), each 0.62 miles in length; approximately 100 waste packages will be emplaced in each tunnel.

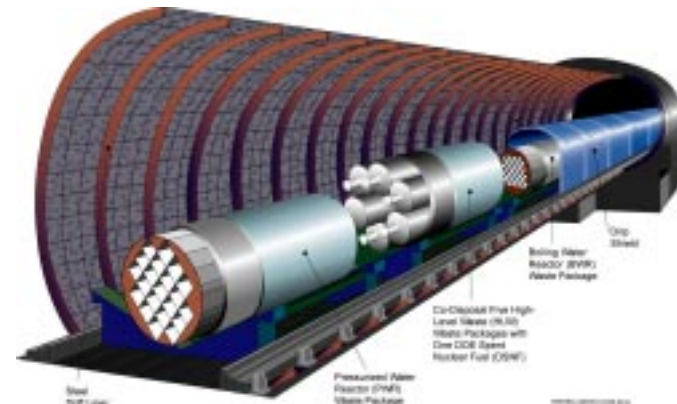


# Reference Waste Package Design Concept

## Commercial Spent Nuclear Fuel Waste Package

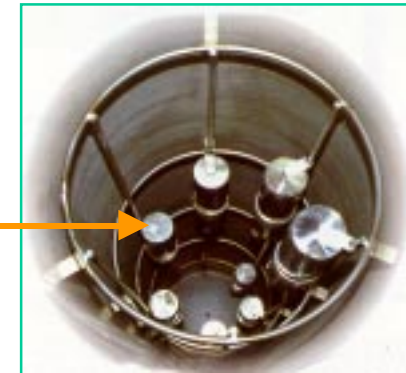
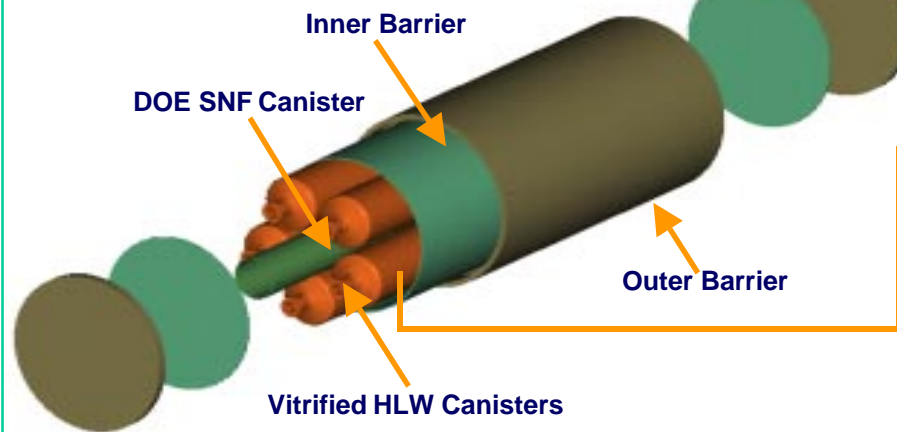


## Cutaway of a Drift With Three Representative Waste Package Types



Waste packages contain canisters of defense high-level waste, commercial and DOE spent nuclear fuel, and immobilized plutonium waste form.

## Co-Disposal Waste Package

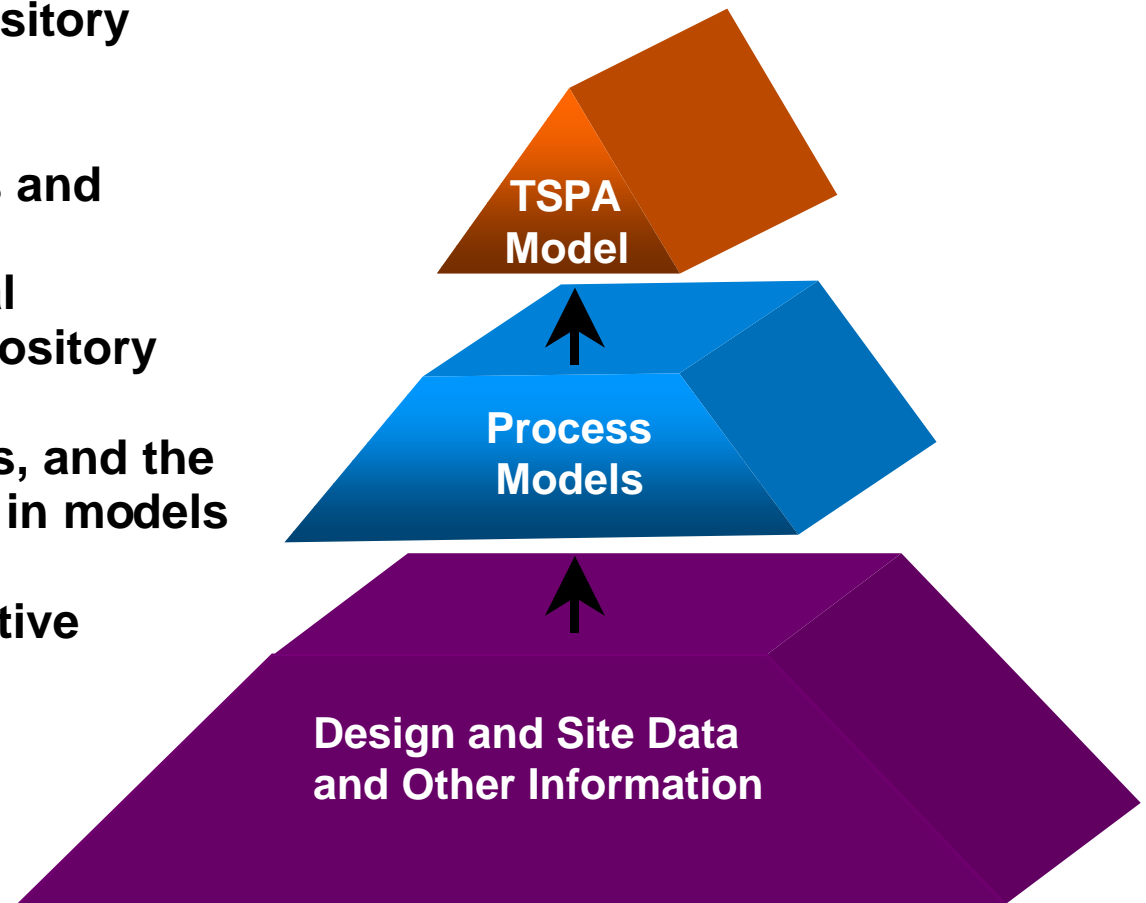


Ceramic mixture of plutonium oxide "discs" embedded in canisters which will be filled with vitrified high-level radioactive waste. The canisters will meet the spent fuel standard to prevent diversion.

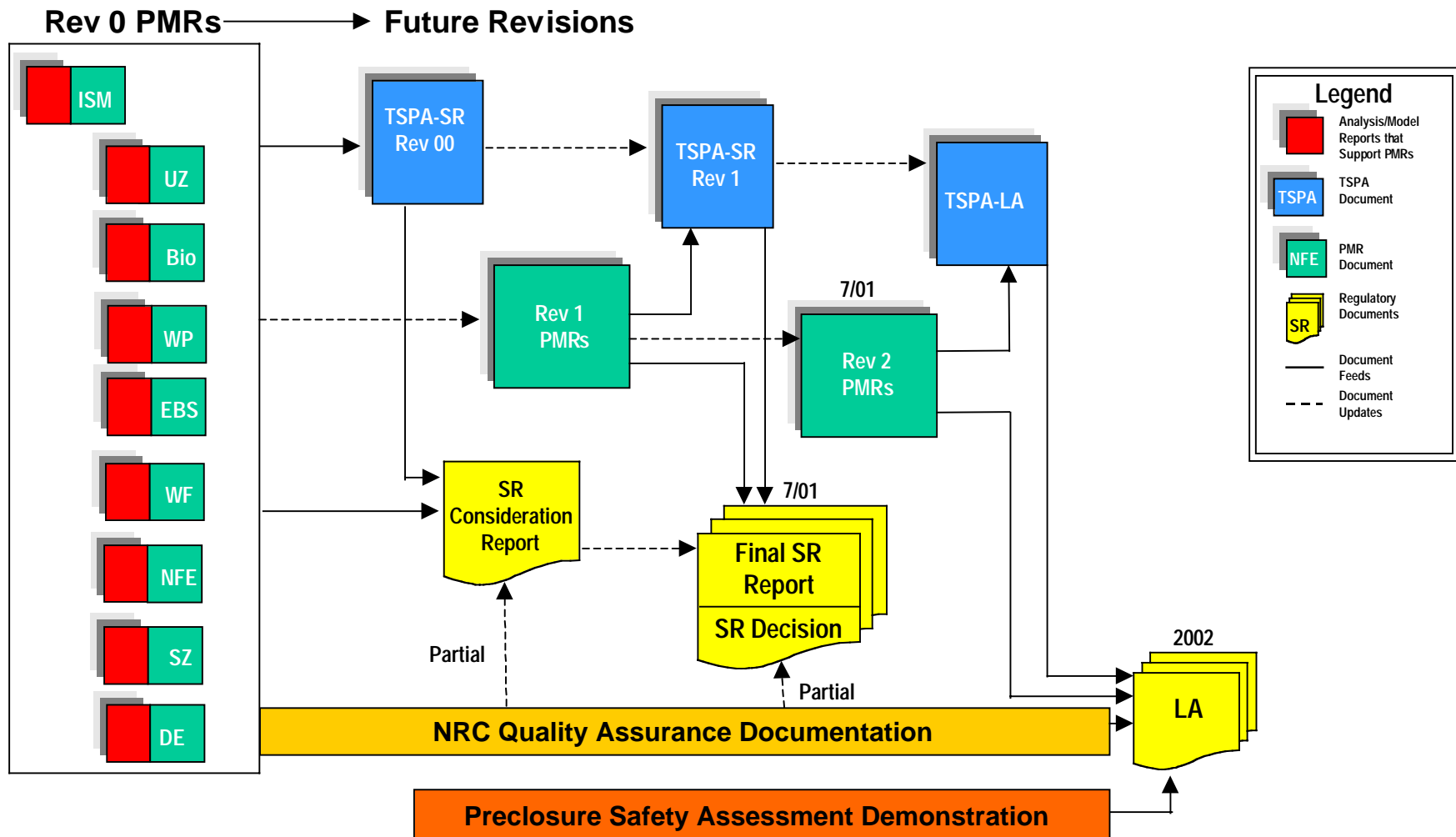
**Note:** Engineering enhancements underway.

# ***Total System Performance Assessment is the Foundation for Demonstrating Compliance***

- Evaluates long-term performance of a repository supporting our repository safety strategy
- Calculates potential dose rates and uncertainties using detailed mathematical models of natural processes important to the repository
- Describes models used, results, and the significance of “uncertainties” in models
- Describes the effects of disruptive events on performance
- Compares the performance of the reference design with additional design options



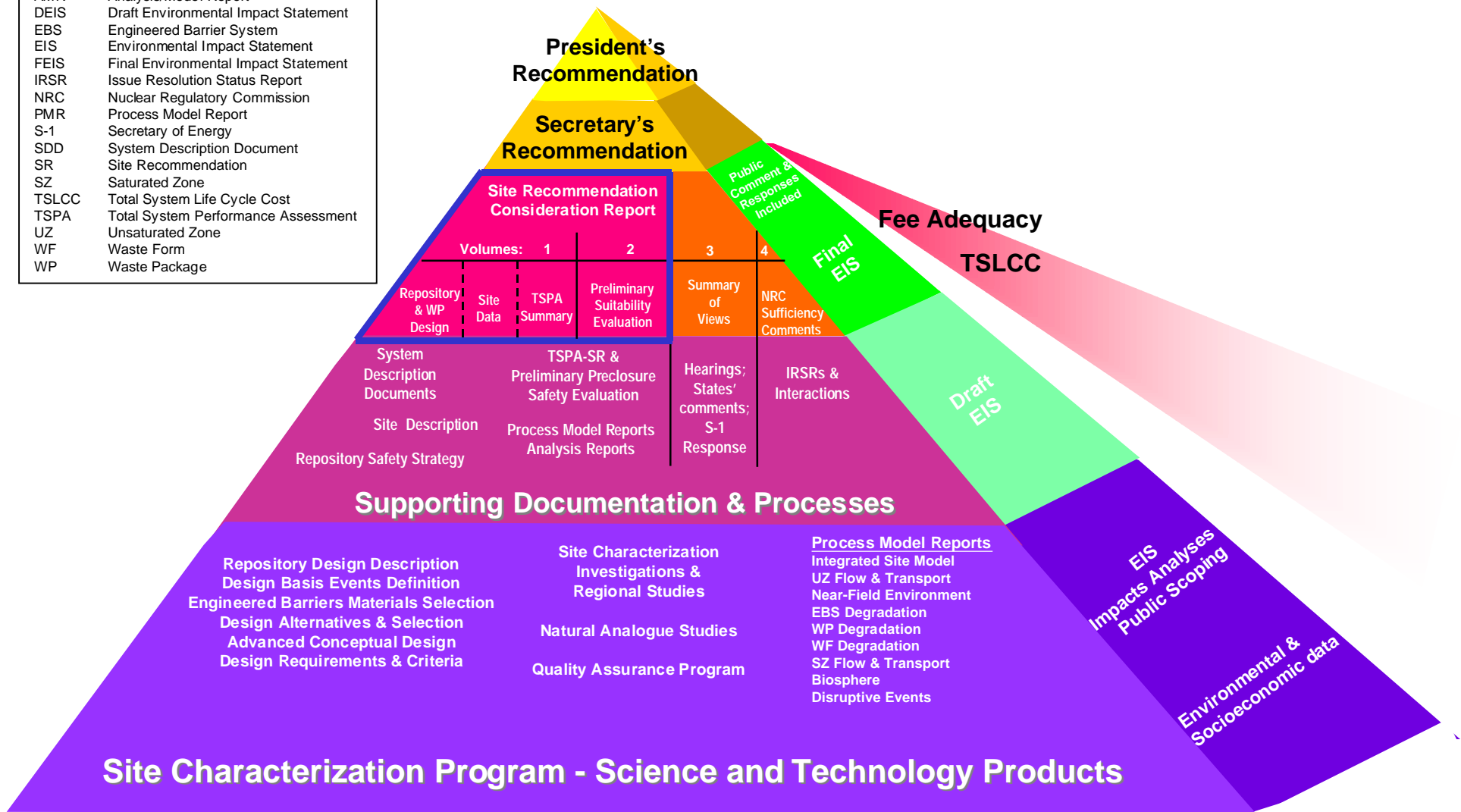
# Integrated Site Recommendation and License Application Program





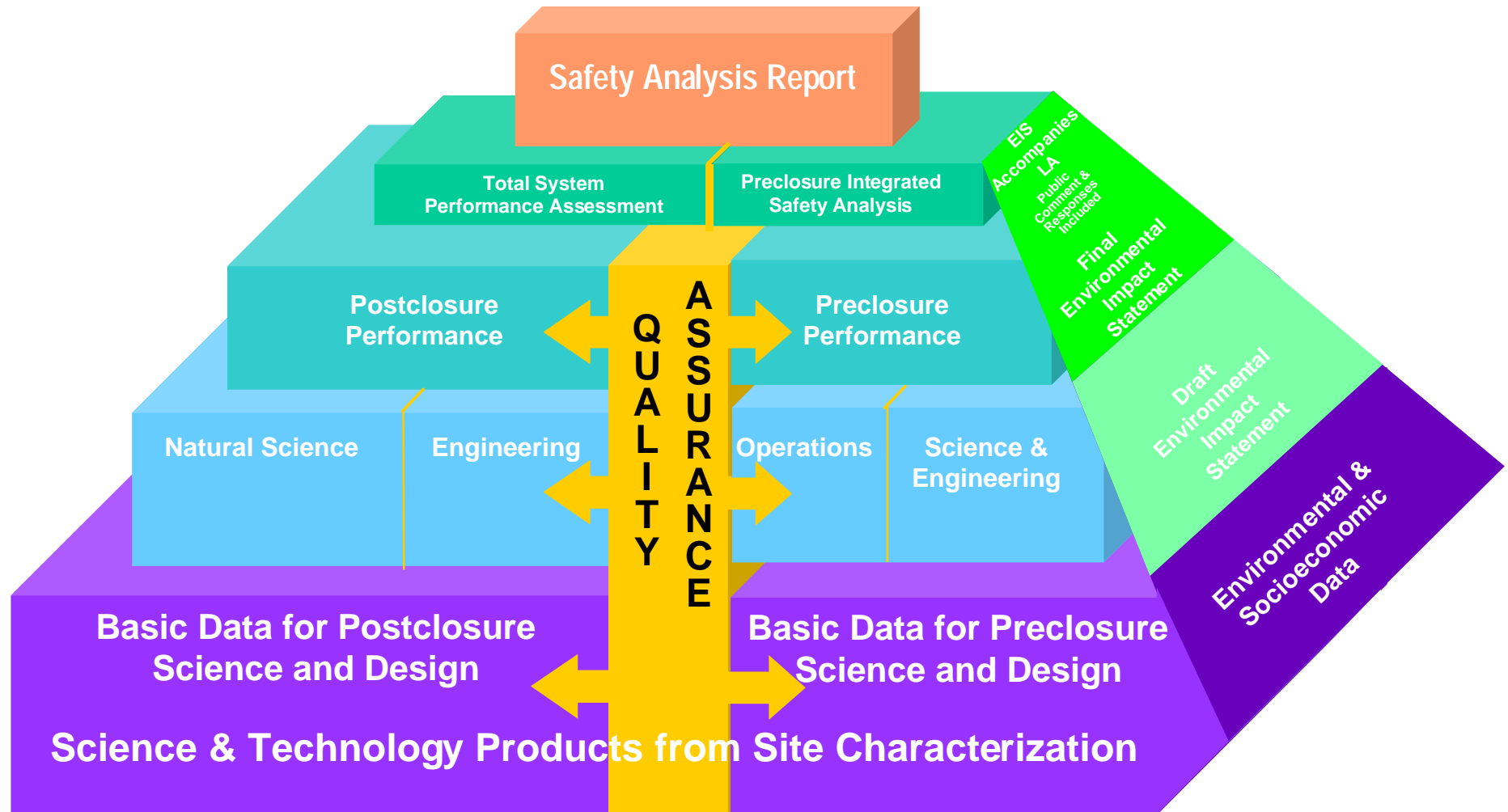
# Site Recommendation Document Structure

AMR	Analysis/Model Report
DEIS	Draft Environmental Impact Statement
EBS	Engineered Barrier System
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
IRSR	Issue Resolution Status Report
NRC	Nuclear Regulatory Commission
PMR	Process Model Report
S-1	Secretary of Energy
SDD	System Description Document
SR	Site Recommendation
SZ	Saturated Zone
TSLCC	Total System Life Cycle Cost
TSPA	Total System Performance Assessment
UZ	Unsaturated Zone
WF	Waste Form
WP	Waste Package



SR Pyramid Rev. 00; Draft B - 8/24/99

# License Application Structure



# Promoting Responsible Waste Management

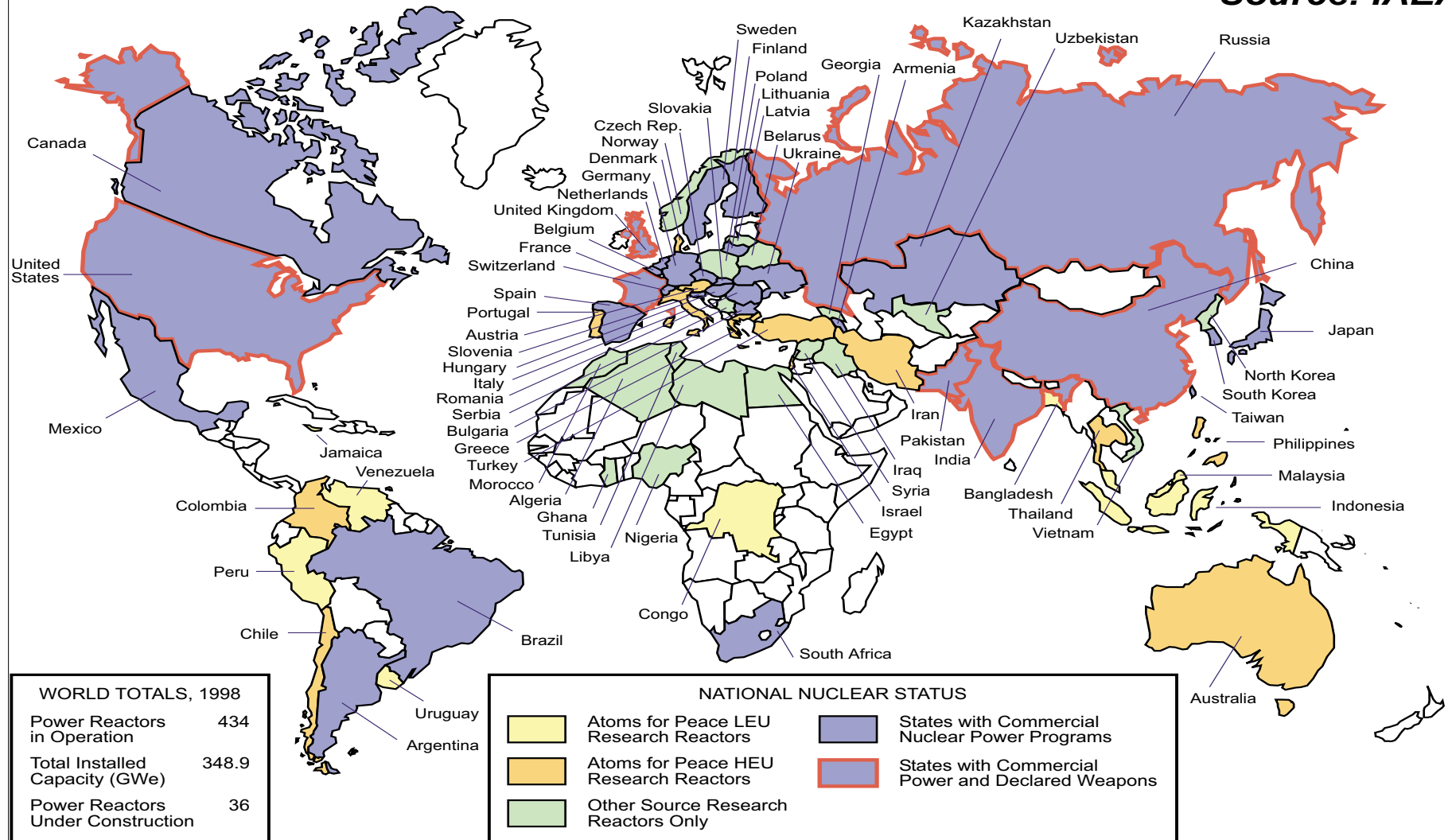
*“The United States stands ready to share openly with other nations its experiences, its plans, and its views regarding approaches to disposal. We recognize that many other nations have developed their own well-considered approach, and we are interested in learning about them. Together, we must strive to forge a global approach to the challenge of responsible and acceptable disposal of nuclear materials.”*

Secretary of Energy Bill Richardson



# Repository Concept is a Vital Component of Global Nuclear Materials Management

Source: IAEA



NuclearNations 5 colors Jan00 hqcc.fh7

As of January 2000

## ***Near-Term Collaboration with Russia***

- **The Office of Civilian Radioactive Waste Management is working closely with the Russian Federation to advance our mutual non-proliferation objectives**
  - **We are completing a bilateral agreement that will facilitate development of geologic repositories in the United States and the Russian Federation and will promote the sharing of repository technology**
  - **We are evaluating issues associated with the management of radioactive waste and spent nuclear fuel, including shipment, storage, and direct disposal, as partners in a joint Department of Energy-Minatom working group**
  - **We are considering proposals submitted by the Russian Academy of Sciences**

## ***Concluding Remarks***

- **Geologic repositories are necessary regardless of fuel cycle policy**
- **The scientific infrastructure is a vital and necessary component of any successful program**
- **The Office of Civilian Radioactive Waste Management (U.S. Department of Energy) stands ready to cooperate with you to**
  - Share our experiences and lessons learned
  - Provide scientific information and technical talents
- **All can mutually benefit from technology transfer and advancement**
  - More interactions are needed to identify the most effective ways to pursue scientific cooperation